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REPORT OF THE LINDANE ADVISORY COMMITTEE

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16. Abstracts In this advisory committee report, the Committee recommends maintenance of the cancellation of all lindane products intended for vaporization. The data collection was begun by the US Department of Agriculture and Committee members were chosen from a list supplied by the National Research Council

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REPORT OF THE LINDANE ADVISORY COMMITTEE

RECOMMENDATION: The Committee recommends maintenance of the cancellation of registration of all lindane products intended for vaporization. This includes all products listed in Exhibit 4.

INTRODUCTION AND BACKGROUND

On April 28, 1969, the Department of Agriculture cancelled the registration of lindane products intended for vaporization. These products had been registered under the provisions of the Federal Insecticide, Fungicide and Rodenticide Act. Questions regarding the safety of these products have been raised repeatedly since the first registrations were made in the early 1950's, but there was a dearth of evidence either to support definitive proof of safety or to demonstrate a genuine hazard from the products when used as directed.

The General Accounting Office in its study and report of February 20, 1969, recommended that the Secretary of Agriculture should review the Agricultural Research Service's policy of registering lindane pellets with a view toward resolving the question of safety to human health.

During the period from 1951 to present, evidence bearing on this matter has been accumulating. The Department of Agriculture collected the available information, appointed an Advisory Medical Panel consisting of Bertram D. Dinman, M.D., D.Sc., Victor A. Drill, M.D., Ph.D., and Ted A. Loomis, M.D., Ph.D., and asked them to review the subject of lindane vaporizers.

This panel met January 8, 1969, and issued a summary report addressed to Dr. Harry W. Hays. The panel gave weight to the association of blood dyscrasias with lindane vaporizers, the ability of lindane vapor to penetrate and persist in foods (unless they were sealed in metal or glass), and the availability of less persistent but equally effective insecticides. It was the consensus of the Medical Advisory Panel that the use of lindane by automatic or semi-automatic vaporization techniques should be discontinued because it created a hazard potentially detrimental to human health.

In February 1969, the results of new laboratory tests by the Department of Agriculture using a continuous lindane vaporizer operating under approved conditions in a simulated restaurant situation became available. These results confirmed the ability of lindane to penetrate and persist in exposed foods. Additionally, the available knowledge about the toxicology of lindane was reevaluated by the Department. The conclusion was reached that continued registration of lindane products intended for vaporization is contrary to Section 2 z (2) (c) and 2 z (2) (g) of the Federal Insecticide, Fungicide and Rodenticide Act and that such registrations should be canceled.

Registrants were advised of the cancellation action against lindane products intended for vaporization. Certain firms exercised their appeal rights by petitioning for a referral of the matter to an Advisory Committee as provided under Title 7, Chapter III, Part 364 of the Code of Federal Regulations. Under these provisions the National Academy of Sciences--

National Research Council was asked to suggest potential candidates for the Advisory Committee and the Department of Agriculture then appointed the following individuals:

J. T. Litchfield, Jr., M.D., Chairman
D. G. Crosby, Ph.D.
W. B. Deichmann, Ph.D.
M. B. Shimkin, M.D.
J. C. Street, Ph.D.

The Advisory Committee was requested to consider all relevant factors and submit a report and recommendations as to the registration of the articles subject to the appeal together with all underlying data and a statement of the reasons or basis for the recommendations.

The Committee met in Washington, D.C. on April 27, 1970, to receive its charge, consider the Exhibits and References (Appendices 1 and 2) discussed below and to obtain technical advice from the Agricultural Research Service Staff. The Committee met again on the morning of April 28, 1970, to hear and discuss the presentations by the registrants who had appealed and asked to be heard. In the afternoon of that same day the Committee met in executive session in order to reach a consensus. The meeting was then adjourned with the intent of handling any further developments by mail if possible. Appendix 3 presents details of the proceedings of April 27 and 28, 1970.

REVIEW OF THE HEALTH ASPECTS OF LINDANE

The Committee has undertaken its assignment with full recognition that insecticides are an essential component of our civilization. It was

necessary therefore to consider the public health aspects of the use of lindane as well as all relevant factors which pertained to the specific cancellations of registrations of lindane products intended for vaporization.

The Exhibits and References provided to the Committee are listed in Appendices 1 and 2. Of the Exhibits, 1 through 7, 9 through 12, 14 and 16 were found to relate to background information helpful in orienting the Committee. The remainder and all of the References pertained in some measure to health aspects of exposure to lindane (E 15 and R 8 are identical)*. It was to this material that the Committee directed its attention in particular.

It should be noted that essentially this same material had been studied by a Medical Advisory Panel (E 13), the members of which gave weight to: (a) the association of blood dyscrasias and lindane vaporizers, (b) persistence of lindane and its ability to penetrate food products (unless specially sealed in metal or glass), and (c) the availability of less persistent and equally effective insecticides. Their consensus was that use of lindane by automatic or semi-automatic vaporization techniques creates a hazard potentially detrimental to human health and therefore the sale of lindane for such use should be discontinued. The present Committee decided neither to accept nor reject the consensus of the Medical Advisory Panel because there was no available documentation of the manner in which their consensus was reached. Accordingly the Committee reviewed in depth,

* E = Exhibit - R = Reference - AE = Additional Exhibit

all available information in order to reach an independent conclusion.

THE TOXICOLOGY OF LINDANE

Lindane is relatively stable in the environment. It is persistent in soils but is biodegradable there under wet anaerobic conditions (AE 2). In mammals there are mechanisms for metabolism and excretion of this pesticide. Lindane is not cumulative in blood (E 19), or rat fat in which it is very soluble (R 11). While metabolism of lindane in the human body is apparent, in an inert environment this pesticide is extremely persistent and disappears essentially only by volatilization. For example, six and twelve days after a room was sprayed with lindane the air contained 0.18-0.19 micrograms of this compound per liter (66% of the original concentration)(E 22). In another case, residues of 26% of the original amount of lindane sprayed on either painted walls or plywood panels were present after 179 days (R 14). Still another example of its stability and persistence may be cited wherein cloth was impregnated with lindane and then laundered three times. Only 36% of the lindane was removed, apparently leaving 64% as a residue (R 23).

These properties of fat solubility, stability, persistence and ability to vaporize continuously lead to lindane's ready penetration into food (E 8, R 9, and 15), into the body of chickens and then into the yolk of their eggs, (R 12 and 16), and into exposed humans (E 19).

These are all examples which underlie the need for concern about the public health aspects of lindane toxicity. Animal studies of lindane

toxicity have neither been comprehensive nor reassuring. Lindane vapor in concentrations of 0.2 micrograms per liter is fatal to canaries, budgerigars, and fish (R 9, AE 4). Lifetime feeding of lindane to rats indicated that the no effect level was between 10 and 100 mg/kg/day by mouth. The compound was not carcinogenic in this study (R 2), nor in a study in rats reported by Klimmer, O.R., Arch. Exp. Path. & Pharm., 227, 183-195, 1955, nor in a limited study in which four beagles were given 15 mg/kg for 15 months (Treon, J.F., et al, J. Agric. & Food Chem., 3, 402-408, 1955. A dose of 10 mg/kg per os was not tolerated (liver damage) by dogs over an 18 to 49 day period (R 2). Fifteen mg/kg was lethal to dogs after two doses (R 14). Inasmuch as lindane is not strongly cumulative in animals or man (E 19), consideration of the acutely toxic dosages is especially important. Tabulated below are the single dose LD_{50} values for lindane in the rat, rabbit, and dog, by both oral and intravenous routes.

	LD_{50} in mg/kg	
Species	Oral	Intravenous[a]
Rat	185[d]	7[c]
Rabbit	80[c]	7[c]
"		4.5[b]
Dog	25[c]	4[b]
Man(estimated)	5[c]	0.5[c]

a. Inhalation and intravenous LD_{50}'s are assumed to be identical.
b. (R 1), c.(R 14), d.(R 19) In rats on a low protein diet the LD_{50} was 95 mg/kg.

These data when extrapolated to man suggest an oral LD_{50} of 5 mg/kg and an intravenous or inhalation LD_{50} of 0.5 mg/kg. It is evident that

lindane is a highly toxic substance. Its acute effects are mainly on the central nervous system; longer term effects involve liver damage.

The estimated human LD_{50} values can be compared with some actual and projected results in man. Six of 35 healthy adult patients given 45 mg of lindane in an emulsion had severe toxic effects including in one individual, a ten minute convulsion (E 21, R 6). For a 70 kg man this dose is 0.64 mg/kg or about 1/8 of the estimated human oral LD_{50}.

In the matter of inhalation, it makes little difference whether the chemical is continuously vaporized or applied as a one shot fumigation (repeated no sooner than two weeks) because in either case the concentration of lindane vapor maintained, will be of the order of 0.2 micrograms/liter of air (E 22). The concentration of lindane vapor in a space containing substantial residues following fumigation will depend on a number of variables. In particular, the temperature is important because the saturated vapor concentration of lindane in equilibrium with air, will vary from 0.26 at 15°C. to 1.78 micrograms/liter at 30°C. It has been shown (R9) that when lindane is applied continuously at a rate of 10 gms/24 hrs/13,000 cu. ft. which is slightly more than 1/2 the single recommended dose from the "one shot" fumigator, by 48 hours the air in a room at 29-34°C. contained 0.2 micrograms per liter. This room had air circulation, but only minimum ventilation associated with personnel entering and leaving. When such a rate of application of lindane was continued the air concentration leveled off at 0.54 micrograms per

liter. After discontinuing the application of lindane it required 10 days for the air concentration in this heavily contaminated room to decrease to 0.27 micrograms per liter. Thus the figure of 0.2 micrograms per liter of air regardless of device, appears conservative.

A normally active adult breathes 850 liters/hour or about 20,000 liters/day. He could thus inhale 4 mg of lindane/day from the above concentration. Since the inhalation LD_{50} for a 70 kg man was estimated to be 35 mg this would amount to 1/9 of a possibly lethal dose for each day of continuous exposure. A slightly different method of extrapolation led to an estimated human LD_{50} of 32 mg (R 14). These potential exposures are 4.5 times greater than the WHO-FAO acceptable daily oral intake of lindane and thus as much as 45 times greater than might be acceptable by inhalation.

Up to August 1953 there were 44 known human cases of lindane intoxication; of these, 31 were associated with either vaporizers or fumigators (R 14). From 1954 to 1969 the Department of Agriculture recorded 37 accidents involving lindane (E 18). In these there were seven deaths among children one and one-half to eight years o'd, of which six were known to be due to ingestion of lindane pellets (AE 7). The Council of Pharmacy and Chemistry of the American Medical Association has repeatedly called attention to the hazards posed by the practice of vaporizing lindane in space occupied by humans (R 3,4,8 and 10). Peripheral neuritis and aplastic anemia are examples of possibly insidious effects from chronic

exposure to lindane.

CONCLUSIONS AND RECOMMENDATION

The Committee was impressed by the incomplete toxicologic data available on lindane, especially long term studies of chronic effects. There is a dearth of both laboratory and epidemiologic studies. The members of the Committee urge that adequately controlled studies be undertaken in industrial and other human populations with long term exposure to lindane and/or other pesticides. Adequate laboratory studies should support the investigations in man. Studies on the effects of combinations of pesticides should be mandatory whenever a registration involves such a combination. However, existing data are sufficient to indicate the reality of human hazard. There are four areas which are clearly not open to argument. First, the closeness of the observed or calculated levels of lindane from vaporizing devices to the toxic threshold, is supported by many clinical examples; second, continued high dermal and respiratory levels persist in rooms fumigated with lindane devices; third, it is a certainty that crawling infants, the sedentary, and the bedridden will receive higher exposure than the literature would indicate, and fourth, the attractiveness and availability to children of lindane for use in vaporizers is obvious.

The Committee was concerned with the fact that lindane tablets and powder are readily available in supermarkets, drug stores, etc. The powder in envelopes has been mistaken for sugar (R 10), and the pellets resemble aspirin or antacid tablets. Both forms of lindane have been ingested

with se-ious and even fatal consequences (E 18). The Committee felt strongly that a substance as toxic as lindane should not be ubiquitously available to the general public. We concurred with the premise expressed by Dr. DuBois (E 17) that "it is always unsound to expose human beings to the same concentration of a poison as the insects which you wish to destroy," if such exposure is routine or continuous.

However, the committee makes a clear distinction between the acceptable practice of applying suitable concentrations of lindane as directly as possible onto susceptible insect pests and in their immediate environment, as opposed to the unacceptable practice of creating a generally insecticidal environment.

The consensus of the Committee was that lindane should not be used to create and maintain an insecticidal atmosphere within space occupied by humans. Because there is not sufficient benefit to offset the risk of intoxication, the prophylactic use of lindane cannot be justified.

Because of these considerations the Committee unanimously recommends that:

The cancellation of registrations of all lindane products intended for vaporization should be maintained. This includes all products listed in Exhibit 4.

John T. Litchfield, Jr., M.D., Chairman

Date

ADDENDUM:

The names of individuals who contacted the Chairman or members of the Committee outside of the meeting and the substance of the conversations were as follows:

1. Mr. Louis A. McLean representing Continental Chemiste Corporation called the Chairman by telephone early in March 1970 to advise that he would like to present a statement to the Committee and that Dr. Mitchell R. Zavon of the Agatha Corporation would make a technical presentation.
2. On May 4, 1970, Dr. Robert Mobbs telephoned the Chairman asking for information regarding the Committee and its intentions. He claimed to have done work on lindane in the 1940's and stated that it may be an antimetabolite to inositol. He was given no information that was not a matter of public record.
3. May 22, 1970, a representative of Environment Magazine (St. Louis) contacted Dr. D. G. Crosby for information about committee activities. He was referred to, but did not contact the Chairman.

APPENDIX 1

PART I-EXHIBITS

1. Statement of United States Department of Agriculture position regarding lindane vaporizers.

2. Federal Insecticide, Fungicide, and Rodenticide Act, 1964.

3. Rules governing the appointment, compensation, and proceedings of an advisory committee; and rules of practice governing hearings under the Federal Insecticide, Fungicide, and Rodenticide Act, August 29, 1969.

4. Petitioners for advisory committee or public hearing.

5. Petitions for advisory committee or public hearing.

6. Comptroller General of the United States. Report to Congress. Need to resolve questions of safety involving certain registered uses of lindane pesticide pellets. Feb. 20, 1969.

7. Interdepartmental coordination of activities relating to pesticides, by the Department of Agriculture, the Department of Health, Education, and Welfare, and the Department of the Interior. 1964.

8. Pesticides regulation Division, ARS. Lindane vaporizer test, February, 1969.

9. Letter, G. W. Irving, Jr. to L. J. Gehrig, regarding cancellation of registration of lindane products for use in vaporizing devices. April 24, 1969.

10. Notice of cancellation of registration of lindane vaporizer products. April 24, 1969.

11. Notice to manufacturers, formulators, distributors, and registrants of economic poisons. Cancellation of registration of lindane products intended for vaporization. PR Notice 69-9. April 28, 1969.

12. Other actions relating to cancellation of lindane products intended for vaporization:

    a. USDA press release, 1347-69. USDA bans use of lindane insecticide vaporizers. April 29, 1969.

b. Notice to State regulatory control officials, May 26, 1969.

c. Notice to State regulatory control officials, June 20, 1969.

d. USDA press release, 2485-69. Companies appeal USDA ban on use of lindane insecticide vaporizers. August 11, 1969.

13. Opinion of collaborating advisory panel on the subject of lindane vaporizers. March 17, 1969.

14. Letter, N. D. Bayley to Philip Handler, requesting selection of an advisory committee to study problem of lindane vaporizers. July 23, 1969.

15. American Medical Association. Council on Pharmacy and Chemistry. Health problems of vaporizing and fumigating devices for insecticides. Amer. Med. Assn. Joun. 152:1232-34, July 25, 1953.

16. Registration policy for lindane vaporizers. October 17, 1961.

17. U.S. Department of Health, Education, and Welfare. Public Health Service. Ad Hoc Committee report concerning pesticide vaporizing devices. September 22, 1966.

18. Memo from Currie to Bowen, tabulation of accidents.

19. Milby, T. H., Samuels, A. J. and Ottoboni, F.,"Human exposure to lindane; blood lindane levels as a function of exposure." Journal Occup. Med. 10:584-587, October, 1968.

20. Letter, Yoss to Hays concerning use of lindane vaporizers. Feb. 7, 1969.

21. Letter, W. S. McLeod, Canada Department of Agriculture to Justus C. Ward, Hazard of lindane by continuous vaporization in Dwelling. December 2, 1960.

22. Letter, Wayland J. Hays, Jr., DHEW to Justus C. Ward, lindane vaporizers. July 2, 1959.

APPENDIX 2

PART II - REFERENCES

1. McNamara, B.P. & Krop, S.
Observations on the pharmacology of the isomers of hexachlorocyclohexane.
J.Pharm. Exper, Therap. 92:140-146 Feb. 1948.

2. Fitzhugh, O.G., Nelson, A.A. & Frawley, J.P.
Chronic toxicities of technical benzene hexachloride and its alpha, beta and gamma isomers.
J.Pharm. Exper.Therap. 100:59-66 Sept. 1950.

3. Amer.Med.Assn. Council on Pharmacy and Chemistry. Committee on pesticides
Toxic effects of technical benzene hexachloride and its principal isomers.
JAMA 147:571-574 Oct. 6, 1951.

4. Amer.Med.Assn. Council on Pharmacy and Chemistry. Committee on Pesticides
Health hazards of electric vaporizing devices for insecticides.
JAMA 149:367-369 May 24, 1952.

5. Leland, S.J.
Some observations on the toxicology of lindane.
Chemical Specialties Mfg.Assn.Proc. 38:110-112 June 1952.

6. Leland, S.J.
Appropriate use of vaporized lindance in insect control.
Unpublished ms. (1952)

7. Kettering Lab., Cincinnati, Ohio.
Responses of experimental animals to intermittent exposure to air bearing freon-propelled aerosols of peanut oil with and without lindane. June 1953.

8. Amer.Med.Assn. Council on Pharmacy and Chemistry. Committee on Pesticides
Health problems of vaporizing and fumigating devices for insecticides.
JAMA 152:1232-34 July 25, 1953.

9. Queen, W.A.
Distribution and adsorption charateristics of vaporized lindane
Assn.Food Drug Officials. Quart.Bull. 17:127-139 Oct. 1953.

10. Amer.Med.Assn. Council on Pharmacy and Chemistry. Committee on Pesticides
Abuse of insecticide fumigating devices.
JAMA 156:607-609 Oct. 9, 1954.

11. Sedlak, V.A.
Solubility of benzene hexachloride isomers in rat fat.
Tox.Appl.Pharm. 7:79-83 1965.

12. Deema, P., Naber, E.C. & Ware, G.W.
Residues in hen eggs from vaporizing insecticide tablets.
J.Econ. Entomol. 58:904-906 Oct. 1965.

13. Loge, J.P.
Aplastic anemia following exposure to benzene hexachloride (lindane).
JAMA 193:110-114 July 12, 1965.

14. Joint Statement of the Public Health Service and the Food and Drug Administration - Appraisal of the health hazard of vaporized lindane. 1965.

Interdepartmental Committee on Pest Control - A statement of the health hazards of thermal generators as used for the control of flying insects. Sept. 21, 1951.

15. Markarian, H., Pratt, J J., Jr., Kane, F. & Kantack, B.H.
Insecticide residue in foods subjected to aerosols under simulated warehouse conditions.
J.Econ. Entomol 59:844-846 Aug. 1966.

16. Whitacre, D.M. & Ware, G.W.
Retention of vaporized lindane by plants and animals.
J.Agr.Food Chem. 15:492-496 May/June 1967.

17. West, I.
Lindane and hematologic reactions.
Arch.Environ.Health 15:97-101 July 1967.

18. Lindgren, D.L., Sinclair, W.B. & Vincent L.E.
Residues in raw and processed foods resulting from post-harvest insecticidal treatments. (p.37-39. Thermal vaporizers.)
Residue Revs. 21:1-121 1968.

19. Boyd, E.M. & Chen, C.P.
Lindane toxicity and protein-deficient diet.
Arch.Environ.Health 17:156-163 Aug. 1968.

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Knochenmarkschaden nach beruflicher einwirkung des insektizids gamma-hexachlorcyclohexan (lindan).
Acta Haemat. 38:337-350 1967.

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Fatal poisoning from ingestion of benzene hexachloride.
Ghana Med. Jour. 3:(2); 72-74 June 1964.

22. Jedlicka, V., Hermanska, Z., Smida, I. & Kouba, A.
Paramyeloblastic leukaemia appearing simultaneously in two blood cousins after simultaneous contact with gammexane (hexachlorcyclohexane).
Acta Med.Scand. 161:447-451 1958.

23. Horton, R.G., Karel, L. & Chadwick, L.E.
Toxicity of r-benzene hexachloride in clothing.
Science 107:246-247 Mar. 5, 1948.

24. Insecticide vaporizers - help or hazard?
JAMA 149:371-372 May 24, 1952.

In this Section the two days of Committee meeting will be discussed in order to provide a summation of all data underlying the consensus reached and the recommendation made. The Committee utilized the first day to make certain that all members understood the assignment and to review and discuss the Exhibits and References (Appendices 1 and 2) which had been furnished in advance and which pertained to the cancellations at issue. These Exhibits and References are discussed in the Section entitled "Review of Health Aspects of Pesticides." Complete minutes of both days meeting were recorded by the Secretariat.

The morning meeting of April 28 was attended by representatives of three of the four companies who had petitioned for the appointment of an Advisory Committee as is shown in the minutes. It is necessary to note that Additional Exhibits were presented to the Committee or received by the Chairman after the meeting. For the record these are:

ADDITIONAL EXHIBITS

1. Letter from L.A. McLean to Dr. J.T. Litchfield, Jr., Chairman, April 14, 1970, with attached Statement on Behalf of Continental Chemiste Corporation.
2. Review of Lindane and Lindane Vaporizers, The Lindane Group, by F.H. Pretsch April 17, 1970, The Agatha Corporation.
3. Statement presented to Lindane Advisory Committee by Thuron Industries, April 28, 1970.
4. The toxic Hazard Associated with Continuous-flow Heat-volatilized Insecticidal and Acaricidal Aerosols. Baker, A.H., et al, Laboratory Practice, 8, 3-11, 1959.

5. Pesticide Residues as Hazards, Barnes, J.M., PANS 15, 2-8, 1969.

6. Letter with attachments from Mitchell R. Zavon, M.D., Agatha Corporation, addressed to Dr. J.T. Litchfield, Jr., Chairman, May 7, 1970.

7. Letter from Dr. Harry W. Hays addressed to Dr. J.T. Litchfield, Jr., Chairman, May 8, 1970.

These additional exhibits were either given to Committee members at the time of the meeting or mailed to them subsequently. They are available from Agricultural Research Service. The main body of the report will be concerned with the Exhibits and References of Appendices 1 and 2 so that it is necessary to deal with the above seven items at this point.

The first is a legal document which when presented on April 28, was referred to counsel for the Department of Agriculture for disposition since it did not deal with scientific or technical data concerning lindane. The same is true of Item 3 which was similarly referred. Item 2 is a well organized review of the literature relating to lindane and lindane vaporizers. While it adds some additional references to those submitted to the Committee it does not affect materially the information bearing on the crucial issues of safety. Item 4 concerns a study made with continuously operating vaporizers dispensing a mixture of 60% lindane and 40% DDT in animal quarters over a period of slightly more than one year. This study involved exposure of animal attendants as well as a variety of animals, birds, and insects. This item was particularly cited by industry representatives as indicative of the safety of

lindane when used as recommended. There was no indication of any ill effect of any kind on the exposed animal attendants, but it should be noted that the concentrations of insecticides in the air were lethal to budgerigars in an average of 18 days (range 2-73 days). Furthermore, the maximum exposure of an animal attendant in the room with the highest concentration of lindane was 206 intermittent hours (5 days/week) out of a total of 9144 hours, or 2.25% of the total time period. This particular animal attendant was exposed an additional 824 intermittent hours or 9% of the total time in another room with a concentration of lindane 70% of that in the first room. In the case of a continuous vaporizer in an industrial establishment, a worker could be exposed to about 24% of total time each week (40/168 hours) which is an order of magnitude greater.

Item 5 is a general paper on pesticides which mentions only DDT specifically and does not relate directly to lindane. Item 6 with attachments pertains to the insecticidal activity of lindane dispersed as a one shot fumigation in laboratory tests involving various insects. These data were submitted because Dr. Zavon had mentioned the need to prevent encephalitis transmitted by Culex pipiens. Members of the Committee asked if lindane was effective against this mosquito and the answer was not available. The data submitted in Item 6 do not contain test against Culex pipiens or any other mosquito. Finally Item 7 is a response to the Committee's request for additional information about the fatalities tabulated in Exhibit 18.

In the course of the morning meeting April 28, 1970, the labeling of several of the affected products was examined. The Committee expressed concern about the fact that several products for fumigation contained a combination of lindane with other pesticides. In one case lindane was combined with DDVP (dichlorovos) and in another with p-dichlorobenzene. There was apparently no knowledge concerning the joint toxicity which might result from such a combination and apparently no such toxicity studies have ever been conducted. In the afternoon, the Committee considered the Additional Exhibits which were available and concluded its deliberations.

John T. Litchfield, Jr., M.D., Chairman

July 2, 1970
Date

This is to certify that the Lindane Advisory Committee report submitted by the Chairman Dr. John T. Litchfield, Jr., on July 2, 1970, is the report which was approved by the Committee.

William B. Deichmann, Ph.D. — July 20, 1970
Date

James C. Street, Ph.D. — July 23, 1970
Date

Michael B. Shimkin, M.D. — Date

Donald G. Crosby, Ph.D. — August 6, 1970
Date

The last person to sign should forward to the Secretariat.

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